



forming unit assay and the half maximal effective concentration (EC50) was calculated. The inhibition of *E. faecalis* biofilms was tested using crystal violet and Alamar blue assays and the respective EC50 values were calculated. Peptide effects on an in vitro model of dental infection consisting in 2-day-old *E. faecalis* biofilms grown on hydroxyapatite disks were assessed using live/dead staining and confocal scanning laser microscopy (CLSM). In order to test peptide cytotoxicity, L929 fibroblasts were exposed to KP and L18R for 24 hours and cell metabolism was evaluated by MTT assay.

Results: Both KP and L18R showed an effective bactericidal activity against planktonic *E. faecalis* and L18R proved to be 10-folds more effective compared to KP (EC50 value of 4.520×10^{-6} M versus 3.624×10^{-7} M). The two peptides were found to have a dose-dependent inhibitory effect on *E. faecalis* biofilm grown on polystyrene microplates. The EC50 values, calculated with reference to biomass reduction (crystal violet assay), were 1.607×10^{-4} M and 1.411×10^{-5} M for KP and L18R, respectively. Considering metabolic activity reduction (Alamar blue assay), KP and L18R EC50 values were 1.235×10^{-4} M and 1.585×10^{-5} M, respectively. CLSM images showed that both KP and L18R remarkably reduced the viability of *E. faecalis* within biofilms grown on hydroxyapatite disks. Toxicity studies demonstrated that 24-hour incubation with the two peptides at concentrations between 50 µg/ml and 200 µg/ml had no adverse effect on L929 fibroblast viability.

Conclusion: KP and L18R effectively inhibited *E. faecalis*, both in planktonic and biofilm state and showed no cytotoxic effects in our experimental settings. L18R demonstrated a more potent antibacterial activity compared to KP. The obtained results show that antimicrobial peptides may represent a promising new strategy for endodontic infection control.

Post-operative quality of life following root canal treatment performed with different shaping and root canal filling techniques: an observational study

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Aim: The aim of the study was to compare two different shaping systems, Protaper Next and WaveOne Gold, and two different root canal filling techniques, thermafil and bioceramics, in terms of postoperative quality of life (POQoL).

Methods: Sixty-nine healthy subjects with asymptomatic or symptomatic irreversible pulpitis and pulp necrosis, with or without apical periodontitis, were enrolled and

a primary root canal treatment was carried out. The treatment was performed in two sessions, at least 3 days apart from each other. Cavity access and root canal shaping were carried out during the first session, while the second one was dedicated to root canal filling. After data collection, patients were divided into 4 groups:

- Shaping performed with Protaper Next (PTN) and filling with Thermafil;
- Shaping performed with WaveOne Gold (WOG) and filling with Bioceramics;
- Shaping performed with WaveOne Gold and filling with Thermafil;
- Shaping performed with Protaper Next and filling with Bioceramics;

Glide path was performed with ProGlider in group 1 and 4 and with WaveOne Gold Glider in group 2 and 3. Irrigation was conducted with 5% NaOCl and 10% EDTA for each treatment. POQoL indicators were evaluated for 3 days after each session with self-assessment questionnaires. They evaluated difficulty in chewing, speaking, sleeping, carrying out daily functions, social relations, medium and maximum pain and quality of life, with a Likert-like scale ranging from 0 (none) to 10 (very much). The variation of each indicator over time was analysed with T-student test for repeated measures, and statistical significance was set at $P < 0.05$.

Results: Post-operative pain curves demonstrated a more favourable time-trend in the PTN ($P = 0.02$), probably due to a lower amount of debris extruded beyond the apex during the shaping, if compared to reciprocating instruments. Moreover, lower pain values were recorded in Bioceramic groups, especially in the first day following the root canal filling ($P = 0.023$).

Conclusion: Rotary instrumentation influenced POQoL less than reciprocating systems. Moreover root canal filling carried out with Bioceramic sealers may be associated to a better outcome in postoperative pain.

Use of reciproc instruments with different motions: cyclic fatigue testing with simulation of the body temperature

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Aim: To assess the influence of different motions on the cyclic fatigue resistance of Reciproc instruments simulating the temperature of the clinical conditions.

Methods: The sample size was determined using statistical software set with the following parameters: $\alpha = 0.05$, $\beta = 0.20$, $\delta = 30.0$, $\sigma = 28.0$. The experiment required 54 Reciproc files. Brand new R25 files were randomly

allocated to three groups defined by the tested motion: continuous rotation at 300 rpm (n=18), "RECIPROC" mode (n=18), and "WAVEONE" mode (n=18). The same endodontic motor was used for all groups (X-Smart IQ). All files were rotated/reciprocated until fracture inside a custom-designed artificial canal with 60° angle and 5-mm radius of curvature milled in a stainless-steel block. The testing device was electrically heated to keep its internal temperature at 35±1°C, which was constantly monitored with a thermometer. After file separation, the time to failure was registered with a digital chronometer and the length of the fractured fragment measured with a digital calliper. The fracture surface of each file was observed at the scanning electron microscope to perform a qualitative fractographic analysis. The collected data (time to fracture and fracture length) were tested for the normality of the distribution and the equality of variances with a Shapiro-Wilk and a Levene test, respectively. The dependent variables were compared amongst groups by means of a multivariate analysis of variance and Tuckey post-hoc test (p=0.05).

Results: The continuous rotation group exhibited the shortest lifespan among the considered groups (85.4±9.5 s to failure). Both reciprocating motions were associated with a significant improvement of fatigue resistance (p<0.001). The "RECIPROC" mode allowed for longer time to failure than the "WAVEONE" mode, with 141.6±19.4 s and 117.2±11.2 s to failure, respectively. The absence of differences among the considered groups in terms of fracture length confirmed the correct positioning of the files inside the artificial canal. The scanning electron microscopic analysis showed signs of file separation ascribable to cyclic fatigue.

Conclusion: The present study preliminary demonstrated that the native "RECIPROC" motion use of R25 Reciproc files should be preferred over other types of motions to prevent file separation in the clinical setting.

In vitro evaluation of cyclic fatigue resistance of two reciprocating endodontic instruments

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Aim: Aim of this study is to compare and evaluate two different reciprocating rotary instruments: Wave One Gold (Dentsply, Maillefer) (WoG) Edge One Fire (EdgeEndo, Albuquerque, New Mexico). The Edge One Fire (EoF) is a new recently commercialized device for endodontic treatments. These instruments were tested because they both have the same dimension, cross section and they are used with the same reciprocating motion. Therefore, data comparing EoF to other similar instruments are still missing. EoF is designed to shape

canals in a reciprocating motion. The motion for WoG is well studied yet. The manufacturer suggests the use of the same motion for EoF. Thus, both instruments were used in the same alternate motion.

Methods: A total of 40 different Ni-Ti endodontic instruments of length of 25 mm and tip size 35 were tested for their fatigue cyclic resistance. The instruments were analyzed using an optical stereomicroscope with a magnification at 20X, instruments with defects were discarded from the study. They were rotated using the reciprocating motion (150° CCW - 30° CW) proprietary of the manufacturers for the WoG using the Endodontic motor X smart plus (Dentsply, Maillefer). 20 Wave One Gold medium tip size 35 and taper 6% and 20 Edge One Fire medium tip size 35 and taper 6%. Cyclic fatigue resistance was performed in a stainless steel (SS) root canal made for the aim. This artificial root canal was made with a 2 mm radius of curvature and an angle of curvature of 90° degrees. This device was previously validated in many published studies to assay in vitro cyclic fatigue resistance of instruments. Each instrument was rotated until separation happened and the time to fracture (TtF) was recorded. As the fracture occurred, the time was recorded, the fractured fragment was analyzed, and the fracture length was registered (FL). Means and standard deviations of TtF and FL were calculated and data were subjected to the Student's T-Test (P < 0.05).

Result: Data show a statistically significant difference between the two instruments. The Edge One Fire showed a higher resistance compared to Wave One Gold (p<0.05). Mean values were 14,67±0,57 and 28,00±2,64 seconds for WoG and for EoF respectively. Conversely, no significant difference was found in the fragment length, mean values 2,41±0,14 mm vs 2,44±0,38 mm for WoG and EoF respectively.

Conclusions: Our study showed a higher resistance, measured by time of fracture, of the Edge One Fire compared to Wave One Gold. Since motion, design and dimension were the same, this divergent can be related to the different thermal treatment applied on the two instruments. This statistically different allows the clinicians to a safer use of the instrument.

Improving resistance to cyclic fatigue and flexural stresses of Ni-Ti rotary instruments through different heat treatments

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Aim: This study aims to evaluate the hypothesis that different heat treatments applied by manufacturers can significantly affect the in vitro resistance to cyclic